Modline 4 Highlights

Features
Rugged, compact and self-contained—the Modline 4 is designed and built for long, trouble-free service in harsh environments and is packaged in a sealed, cast aluminum NEMA 4 rated housing.

Stable drift-free operation
The Modline 4 DC operation has no moving parts—which guarantees a stable performance. The solid state electronics incorporates a chopper-stabilized amplifier which assures long term, accurate drift-free operation and the 4-20 mA high level current output assures reliable signal transmission over long lines.

Versatile, easy-to-install two-wire transmitter
The Modline 4 requires two wires, a power supply (range of 16 to 40 Vdc) and an installed compatible output (recording or control instrument) to complete the instrument system loop. The two-wire operation simplifies the installation, operation and maintenance of the infrared thermometer. Screw terminals allow easy and secure wire hook ups. The digital emissivity control allows adjustments in 0.01 increments and a response time adjustment pot (potentiometer) lets you select values from 0.15 to 10 seconds to match any requirements.

The loop voltage is provided by the power supply. The loop current is determined by the Modline 4 instrument ordered and is calibrated to provide a linear output of 4 to 20 mA. Instruments within the current loop are supplied with a current proportional to the temperature span of the transmitter (20 mA at full scale and 4 mA at zero scale).

A number of instruments can be placed within the series current loop—provided that the total voltage drop for each instrument does not exceed the total loop voltage. There are six different spectral responses for a wide variety of application processes and the Modline 4 flanges make it easy to mount accessories in hostile environments.

Specifications
Accuracy
Within 0.75% of full scale temperature or 1.7ºC (3ºF), whichever is greater
For the 43-02C and 43-04F: within 0.75% of full scale temperature or 2.3ºC (4ºF), whichever is greater.
For the 22 series and 44-06C: within 1.0% full scale or 2.8ºC (5ºF), whichever is greater.
For the 43 series: ambient temperature transients of 10ºC (20ºF) will cause some errors in reading until sensor is stabilized—allow 15 minutes for warm-up.

Repeatability
0.3% of full scale temperature.
For the 22 series: 0.5% full scale

Response Time
(to 95% of any change in input)
Continuously adjustable from approximately 0.15 to 10 seconds.
For the 43 series:
set to 10 seconds for temperatures from 150ºC (300ºF) or lower.

Emissivity Range
Adjustable from 0.10 to 0.99 in 0.01 increments.
For the 43 series: minimum emissivity setting is 0.9 for all temperatures 150ºC (300ºF) or lower and 0.5 for temperatures above 150ºC (300ºF).

Peak Picker Option
Decay rate adjustable from 15 seconds to 30 minutes (approximately) for full scale decay.
Note: Peak picker is a standard feature for 22 series instruments.

Power Supply/Load Requirements
Input voltage: 24 Vdc nominal
Input voltage range: 16 Vdc minimum to 40 Vdc maximum
Max. load resistance:
≤ 1 ohm at 16 Vdc;
400 ohms at 24 Vdc;
1200 ohms at 40 Vdc
Output Current: 4 to 20 mA

Temperature Coefficient
≤ 0.015% of span per ºF change from nominal value of 77ºF over a range of 32 to 150ºF;
≤ 0.027% of span per ºC change from nominal value of 25ºC over a range of 0 to 66ºC.
For the 43 series:
≤ 0.05% of span per ºF change from nominal value of 77ºF over range of 32 to 150ºF;
≤ 0.08% of span per ºC change from nominal value of 25ºC over range of 0 to 66ºC.
For the 22 series:
≤ 0.20% of span per ºF change from nominal value of 77ºF over range of 32 to 130ºF
≤ 0.035% of span per ºC change from nominal value of 25ºC over range of 0 to 55ºC.

Ambient Temperature Range
32 to 150ºF/0 to 66ºC (without water cooling);
32 to 400ºF/0 to 200ºC (with water cooling).
For the 22 series: 32 to 130ºF/0 to 55ºC (without water cooling).

Sensor Humidity
Limited from 10 to 90% non-condensing distance.

Environmentally-sealed Housing
Aluminum casting rated IP56, NEMA 4

Optical/Mechanical Alignment
Optical axis is within one degree of mechanical center line (0.2 inches per foot separation distance/within 17 mm per meter separation distance).
For the 22 series: optical axis is within two degrees of mechanical center line (within 0.4 inches per foot/33 mm per meter) separation distance.

Sensing Head Weight
1.2 kg (2.6 lbs); 9.25 kg (20 lbs) with optional water cooling enclosure.
Accessories

Power supply
The Ircon® 24 VDC power supply is capable of powering up to ten Modline 4 units. The rugged, sealed package can be chassis-mounted or back panel-mounted using 4 tapped holes (factory provided). The screw terminals permit secure wiring. A current-limiting circuit protects the power supply in case of a short circuit.

Model #PS4-24 specifications:
Output voltage: 24 VDC, ±2%
Output current: 840 mA
Ambient temperature range: -25 to 60°C (-13 to 140°F)
I/O isolation voltage: 3000 VAC
Resistance: 100 meg ohms
Power: 100-240 VAC, 50/60 Hz

TV-View Meter
The TV-View digital indicator is powered by 110 or 220 VAC power. The display is programmable to work with Modline 4 sensors in both degree F and degree C. The indicator is IP65, NEMA 4 rated, with a sealed front bezel.

Options
Water-Cooling Enclosure and Air Purge
Water flow of 40 to 75 liter (10 to 20 gallons) per hour at temperatures of 32°C (90°F) is sufficient for most applications.

When the case temperature of the instrument is expected to exceed 66°C (150°F) due to ambient conditions, the WA-3 water cooling accessory gives a uniform temperature, isolates the transmitter electronics from thermal influence and permits operation in ambient temperatures up to 85°C (180°F). The EE-2 permits operations in ambients up to 200°C (400°F).

The Ircon AA-3 air purge accessory is recommended when the environment contains smoke, particles, steam and other impurities. A flow of clean, dry industrial air will keep the optics clear under most industrial conditions.

Peak Picker
The peak picker option provides circuitry which responds to the highest instantaneous temperature value and holds this signal through an adjustable slow decay rate.

The peak picker option is necessary if the sight path in your process is interrupted by smoke or steam (between the instrument and the target) or if the target moves in and out of view of the instrument.

Swivel Mounting Base
The SB-1 swivel mounting base lets you aim the line of sight. You can tilt, swivel and lock the mounting base in place.

Note: You cannot use the WA-3 and AA-3 together with models 43-04F or 43-02C because the cone vision is obstructed and would cause errors in reading. However, they can be used individually.

Optical Characteristics

Spot Size vs Separation Distance
The sensor responds to infrared radiation in an area indicated by the cone of vision. It will measure the target temperature within that cone. The spot size is the diameter of the cone at a particular separation distance.

Optical Characteristics Reference

d = Spot size
D = Separation distance

Note: above diagram not to scale

Spot Size vs Optical Resolution Chart

<table>
<thead>
<tr>
<th>D (inches)</th>
<th>d (inches)</th>
<th>D (mm)</th>
<th>d (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 15</td>
<td>1.0</td>
<td>0 to 380</td>
<td>25</td>
</tr>
<tr>
<td>20</td>
<td>1.7</td>
<td>500</td>
<td>41</td>
</tr>
<tr>
<td>30</td>
<td>3.0</td>
<td>700</td>
<td>67</td>
</tr>
<tr>
<td>50</td>
<td>5.6</td>
<td>1,000</td>
<td>106</td>
</tr>
<tr>
<td>70</td>
<td>8.2</td>
<td>1,500</td>
<td>171</td>
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<tr>
<td>100</td>
<td>12.0</td>
<td>2,000</td>
<td>236</td>
</tr>
<tr>
<td>150</td>
<td>13.0</td>
<td>3,000</td>
<td>366</td>
</tr>
<tr>
<td>200</td>
<td>25.0</td>
<td>5,000</td>
<td>626</td>
</tr>
<tr>
<td>300</td>
<td>38.0</td>
<td>7,000</td>
<td>886</td>
</tr>
<tr>
<td>500</td>
<td>64.0</td>
<td>10,000</td>
<td>1,280</td>
</tr>
<tr>
<td>700</td>
<td>90.0</td>
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</tr>
<tr>
<td>123.0</td>
<td>20,000</td>
<td>2,580</td>
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</tbody>
</table>

Standard Resolution Formula*

If D > 15 inches or 380 mm then:

\[
d \ (\text{inches}) = 0.13 \times (D \ \text{inches} - 15) + 1
\]

\[
d \ (\text{mm}) = 0.13 \times (D \ \text{mm} - 380) + 25
\]

Example:

If D = 45 inches, then:

\[
d = 0.13 \times (45 - 15) + 1
\]

\[
d = 0.13 \times 30 + 1
\]

\[
d = 3.9 + 1
\]

or 4.9 inches (rounded)

* Note: For models 43-04F and 43-02C only

\[
d \ (\text{inches}) = 0.17 \times (D \ \text{inches} - 15) + 1
\]

\[
d \ (\text{mm}) = 0.17 \times (D \ \text{mm} - 380) + 25
\]
**HIGH RESOLUTION**

<table>
<thead>
<tr>
<th>D (inches)</th>
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<th>D (mm)</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.0</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>1.25</td>
<td>300</td>
<td>30</td>
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<td>30</td>
<td>1.5</td>
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<td>60</td>
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<td>70</td>
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<tr>
<td>1,000</td>
<td>49.0</td>
<td>20,000</td>
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</table>

**High Resolution Formula**

If \( D > 60 \) inches or 1500 mm then:

\[
d \text{(inches)} = 0.05 (D \text{ inches} - 60) + 2 \\
d \text{(mm)} = 0.05 (D \text{ mm} - 1500) + 50
\]

If \( D < 60 \) inches or 1500 mm then:

\[
d \text{(inches)} = 0.17 (D \text{ inches}) + 1 \\
d \text{(mm)} = 0.17 (D \text{ mm}) + 25
\]

Example:

If \( D = 2500 \) mm, then:

\[
d = 0.05 (2500 - 1500) + 50 = 0.05 (1000) + 50 = 50 + 50 = 100 \text{ mm}
\]

**VERY HIGH RESOLUTION**

<table>
<thead>
<tr>
<th>D (inches)</th>
<th>d (inches)</th>
<th>D (mm)</th>
<th>d (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.0</td>
<td>0.3</td>
<td>203</td>
<td>7.6</td>
</tr>
<tr>
<td>15.0</td>
<td>1.0</td>
<td>381</td>
<td>25.4</td>
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<tr>
<td>25.0</td>
<td>2.0</td>
<td>635</td>
<td>50.8</td>
</tr>
<tr>
<td>35.0</td>
<td>3.0</td>
<td>889</td>
<td>76.2</td>
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<tr>
<td>45.0</td>
<td>4.0</td>
<td>1,143</td>
<td>101.6</td>
</tr>
</tbody>
</table>

**Very High Resolution Formula**

If \( D > 8 \) inches or 203 mm then:

\[
d \text{(inches)} = 0.1 (D \text{ inches} - 8) + 0.3 \\
d \text{(mm)} = 0.1 (D \text{ mm} - 203) + 8
\]

Note: For sensors with water-cooled castings, multiply spot size (d) from table or formula by 1.1.

Example: If “d” is 8.2 inches per table or diagram, then “d” for water-cooled casting is:

\[
d = 8.2 \times 1.1 = 9.02 \text{ inches}
\]